



U.S. Department
of Agriculture

Cooperative State
Research,
Education, and
Extension Service



WINTER 2002
VOL. 19, NO. 1

AITC *Notes*

What's all this "biotech" hype?

Simply put, biotechnology is the provision of useful products and services from biological processes. It does not necessarily involve scientists in white lab coats hovering over petri dishes. Biotechnology goes back thousands of years, probably to the first use of yeast to convert sugars and starches. Yeast is a little living machine that takes in food and produces excrement. But don't discount that excrement—we know it more commonly as alcohol.

Molds are also neat little machines that produce a variety of by-products. When the ancient Egyptians put moldy bread as a poultice on wounds, they were using biotechnology. The mold probably churned out penicillin, and while not recognized as such, it helped the wound heal.

How these microbes convert raw materials into finished products was not elucidated until 1953 when Francis Crick and James Watson unraveled the molecular structure of DNA, the molecule that controls the inner workings of the living cell. The instructions for everything a cell does are encoded in genes, which are specific fragments of DNA. Basically, genes tell the cell what proteins to produce. Proteins are needed as structural material and as enzymes, the catalysts that control all reactions in a cell. Once DNA's role was clearly understood,

it became obvious that if its structure could be modified, the proteins it produced could be altered. By the 1970s, such manipulation, known as genetic engineering, had become a possibility, where genes could be transferred from one organism to another.

But what does biotechnology do for agriculture?

Making foods more nutritious and tasty. Giving farmers new ways to protect the environment and grow better crops. Feeding a growing world population. That's the promise of biotechnology.

Biotechnology is an extension of the age-old practice of creating new crops by combining existing plants to make them better. These have created crops like wheat, a hybrid of three separate grasses, that help feed the world today, and seedless watermelons and grapes. It's also the blue jeans made of cotton genetically engineered to repel insects with no need for pesticides. Biotechnology allows researchers to continue to improve food and crops by selectively giving plants new qualities, such as more vitamins or minerals.

Could something as simple as a piece of fruit help eradicate the hepatitis B virus, saving hundreds of thousands of lives every year? Dr. Charles Arntzen, a scientist at

Cornell University, thinks so. He is using the tools of biotechnology to produce bananas and tomatoes that contain vaccines against hepatitis B, a deadly virus that attacks the liver. Current vaccines are expensive and must be refrigerated, making them difficult to obtain and administer in developing countries. Dr. Arntzen's edible vaccine would cost less than a penny a dose to make, and could be administered simply by eating a banana chip, or a tomato paste sandwich.

Space-Age Cake

NASA scientist Gus Koerner arrived just in time for H.L.

Johnson Elementary students to harvest their crop of Apogee wheat they planted in September. Three months later, the students worked in teams to thresh the wheat, mill it, mix it with other ingredients and bake a cake. What's so special about this cake?



Apogee wheat is a strain suited to growth in space and was developed by Koerner, an agricultural scientist, and seven other NASA scientists. Koerner's presentation to Kathy Picano's fifth-grade gifted class about the importance of plants in sustaining long-distance space missions might have sowed the seeds of a future NASA career in one of her students.

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"NASA always wants more scientists," said Koerner, a participant in the Space Agriculture in the Classroom project sponsored by NASA and the USDA. Koerner also was there out of appreciation for Picano, who he met last summer in Chicago when she was named the USDA's Agriculture in the Classroom Teacher of the Year.

Apogee wheat is short, has smaller leaves and fewer branches so that you can grow more and is easier to harvest. The strain is designed to thrive hydroponically under artificial light in shelves on spaceships.

"If we go on a 2- or 3-year mission, we're not going to be able to just take a big picnic basket—we're going to produce some of our own food," he said.

NASA will begin long-term experiments with Apogee wheat at the international space station in April, Koerner said. Tests will include planting new crops with seeds from wheat grown in space and measuring the space rate of photosynthesis—the plant's end of the carbon dioxide/oxygen exchange bargain.

As most science students can tell you, plants take in carbon dioxide—which is dangerous to humans—and give out oxygen. No machine devised by NASA engineers can do it better or more efficiently, especially on a long distance trip to, say, Mars, Koerner said.

"In space we want to have a healthy ecosystem, and plants are a natural (carbon dioxide) scrubber," Koerner told the class. "If a machine breaks down a year into a mission to Mars, who are you going to call? But plants, we can always plant more."

Hear more about Space Ag in the Classroom from Gus Koerner as he and his colleagues speak at the AITC National Conference, or logon to the AITC website at agclassroom.org for more information.



Want to hold some real DNA? DNA molecules are long and stringy. A single DNA molecule is too small to see, but if you have enough of them, they will tangle together into a blob big enough to hold in your hand. These DNA clumps are pale white and a little slimy. With this experiment, you can separate the DNA from an onion using kitchen supplies, and see DNA appear out of nowhere from a clear liquid.

What You'll Need

Medium-sized Onion
Knife & Cutting Board
Blender
Salt
Strainer or Sieve
Dishwashing Liquid or
Clear Shampoo
2 Clear Glasses (<12 oz.)
Masking Tape and Pen
2 Spoons and a Stick
Mixing Bowl
Meat Tenderizer
Rubbing Alcohol (<70%)

What To Do

1. Chop onion into chunks and put it in the blender.
2. Add a teaspoon of salt and twice as much water as the onion mixture. Blend for about ten seconds. It should be a mushy mixture.
3. Label two clear glasses with tape. Write "control" on one and "liquid soap and enzymes" on the other.
4. Strain the onion slush by pouring it through a sieve or strainer into a mixing bowl.
5. Fill between one-third and one-half of each glass with the onion juice. Pour the same amount into each.
6. Add dishwashing liquid — one-sixth the amount of the onion juice — to the glass labeled "liquid soap and enzymes." (Don't add any to your control.)
7. Add a half-teaspoon of meat tenderizer to the glass labeled "liquid soap and enzymes." (Don't add any to your control.)
8. Stir gently and wait ten minutes.

- Don't stir too hard or you'll break the long, fragile DNA molecules. Use a different spoon to stir each glass.
9. Slowly (you must do this slowly) pour alcohol into each glass. The amount of alcohol in each glass should equal the amount of mixture in the glass. Don't stir.
 10. You should see alcohol floating on top of your onion mixture. After a few minutes, stringy globs will appear in it. **That's the DNA! You did it!**
 11. Slowly swirl a stick through the alcohol. DNA clumps should stick to it. You can then lift them up for a closer look. Go ahead and touch the DNA—but wash the slimy stuff off your hands afterward!

Go on the [Quest for a Perfect Tomato](#), [Build a DNA Model](#), or [Wear a Chimp on your Wrist](#).

These are more activities to explore genetics at the American Museum of Natural History website, <http://ology.amnh.org/netics/index.html>. A reference reading list is also available.

Free Resources from ED Pubs

Thousands of free titles are available from the US Department of Education Publications Center, ED Pubs. There is something for everyone—teachers, parents, students, administrators, policy makers, teacher educators, researchers, journalists, librarians, and many others. ED Pubs offers a number of products in Spanish and other languages.

For title information or to place your order, call ED Pubs toll-free at 1-877-433-7827. You can also search the ED Pubs catalog and order online, <http://www.ed.gov/about/ordering.jsp>.

Contacts Corner

What are good jobs to keep board members involved?

The key is to harness their skills and interest. Committees are one of the best ways to engage people who want to help. It is the opportunity for members and volunteers to really contribute where their interest and skill areas are strongest. This builds their confidence and can get a lot of energy initiated and work done. Committees do most of the preliminary work on certain projects; they gather information and implement recommendations of the board. If the real work doesn't happen then, it's very difficult for the organization to be effective. If all board members are assigned fundraising responsibilities, again target members' interest and skills with the task that needs to be accomplished. Developing solicitation mailings, writing thank you notes, coordinating special events, are all as important as face-to-face requests.

Charge It!



Giving your donors the option of making contributions or paying for products and services with credit/charge cards can make it easier for them to give to your cause. Your organization can receive payment faster, while reducing the need for processing checks and following up on unfulfilled pledges and unpaid invoices. These benefits are well worth the nominal transaction fees and paperwork to process the charges. Plus, getting set up to accept credit/charge cards is easy!

Donors benefit through:

- **Loyalty Programs** - If donors are enrolled in a loyalty program, they receive points/value for the money they donate.
- **Convenience** - When donors donate or customers pay with credit cards, they can do so on-the-spot, without the follow-up of writing and mailing a check.
- **Year-End Summary** - Some card products offer a year-end summary of charges that itemizes contributions, making it easier to calculate deductions at tax time, or, show how much they paid for similar products/services during the year.
- **Donation Options** - Show your donors that you value their support by allowing them to submit payment using their method of choice.

Depending on the types of payment methods you wish to accept, you will need to contact the following.

- **American Express Cards** - Call (800) Accept-1.
- **MasterCard/Visa** - Contact your local bank and ask them to refer you to a "merchant acquiring" organization. Or, check the Yellow Pages under Credit Card Processing for the names of local bankcard processors.
- **Off-line Debit ("Check Cards")** - If you have established a MasterCard/Visa account, you are all set up for this type of card.
- **On-line Debit ("ATM Cards")** - Both American Express and your bankcard processor require applications to accept these cards. You will need a terminal with a PIN keypad for transactions.

AITC Welcomes New Leadership in AITC & Higher Ed Programs

It is my pleasure to announce the appointment of Ms. Kathleen Cullinan to the position of National Program Leader, Agriculture in the Classroom. She will begin February 25, 2002.

Kathleen is Director of Rural Programs at the American Association of State Colleges and Universities. She brings extensive experience in agriculture, education, organization and management. She has classroom teaching experience, and a proven track record as an administrator. Please welcome Kathleen to the AITC community.

As most you know, I recently began a Federal detail at NASA to work with their Space Grant program. When I return to CSREES in June, I will work for the Associate Administrator in the Office of Planning and Accountability.

Taking over as the new permanent director of USDA's Higher Education Program on January 22, is Dr. Jeffrey Gilmore. Dr. Gilmore has over 25 years of experience in education, including student affairs administration, research, and 15 years of federal service including six at the dept of ed and 9 at USDA. Please welcome Jeff.

We have made great progress together over the past several years. The AITC budget is increasing, we have initiated National Teaching Awards, the web site is growing, and our program portfolio is expanding. In the near future the National AITC Consortium will solicit proposals for two \$25,000 grants to enhance regional AITC activities. I am proud to provide funding for these grants as one of my last official acts.

Take care, stay in touch, and thanks for all you do to increase agricultural literacy.

Henry "H" Bahn



National Conference June 20-22

Discovering Agriculture *Capitol Style* is the theme of this year's AITC National Conference and promises to be an event you won't want to miss!

- Find agriculture behind the scenes of the Smithsonian Institute
- Over two dozen hands-on workshops
- Reception at the US Capitol
- Educational exhibits
- The "how-to's" of Fundraising
- And more

Visit agclassroom.org for details, or for a conference brochure email AITC2002@mdaginthe classroom.com, call 410-208-9701, or mail PO Box 1252, Berlin MD 21811.

Join us in Washington for the fun, resources and excitement of the 2002 Conference!

Upcoming Events

Ag Outlook Forum

February 21-22, Crystal Gateway Marriott Hotel, Arlington, VA. The Forum provides an overview of agricultural prospects and issues. Visit www.usda.gov/oce/waob/agforum.htm.

NMSA Urban Conference

"The Successful Urban Middle School: Closing the Achievement Gap" is the theme for the National Middle School Association's (NMSA) 11th Urban Conference in Pittsburgh, PA, March 7-9. Contact 800-528-NMSA or visit nmsa.org.

National Ag Day

The 2002 National Agriculture Day program on March 20 celebrates America's diversity of landscapes and how agriculture brings harmony to our great land. Details and resources can be found at www.agday.org.

Science Teachers Convention

The National Science Teachers Association National Convention is in San Diego, CA, March 27-30. NSTA conventions are open to all science educators, as presenters or attendees. For additional information, visit their web site at: www.nsta.org.

Career Fair & Training Conference

The National Society for Minorities in Agriculture, Natural Resources & Related Sciences will hold its 17th Annual National Career Fair and Training Conference on April 4-6 in Portland, OR. Call 503-244-4320 or email register@eweme.com. To learn more about the Society, go to their website at manrrs.org.

National 4-H Conference

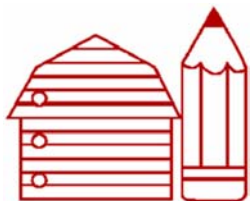
In 2002 the 4-H movement celebrates its centennial with the theme of "4-H The Power of Youth". The National 4-H Conference will be held April 7-13, National 4-H Center in Chevy Chase, MD. Visit www.4-h.org/2002conf/.

Global Science & Technology Week

April 28-May 4, highlights the international nature of science and underscores the importance of math and science education in today's era of globalization. Watch for activities at www.ostp.gov.

Act Now! Teacher Awards Available

Take this opportunity to honor your best teachers! The USDA's AITC Program and the National AITC Consortium are accepting nominations for the *Excellence in Teaching About Agriculture: A National Awards Program*. Designed to focus national attention on the critical role of teaching, the Awards Program will honor three teachers for their outstanding contribution to education about American agriculture. Recipients will receive an honorarium of \$500 and up to \$1,500 toward travel to the 2002 AITC National Conference. Nominations must be postmarked by **March 16, 2002**. For guidelines and an application visit agclassroom.org or call Lindell Williams at the National AITC Program office, 202-720-7925.



Ag in the Classroom Notes is published quarterly by the U.S. Department of Agriculture (USDA), Washington, DC. *Ag in the Classroom* is administered through the Higher Education Programs within the Science and Education Resources Development Division of the Cooperative State Research, Education and Extension Service (CSREES). Newsletter subscriptions are available to the public at no charge. To subscribe, cancel a subscription, or change an address (include mailing label), contact the *Ag in the Classroom Program* at the address on the left.

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